CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Globalization has contributed to economic growth, improved standard of living, and imported trends and fashion throughout the world, with all its advanced technological developments and faster communication facilities. At the same time, the architectural characteristics of different regions and climatic zones have started losing their regional identity and uniqueness, due to globalization. This has resulted in the use of irrelevant design principles and materials in the built environment, which ultimately leads to environmental degradation. Buildings today do not have any relevance to their context, climate, and the user. The building industry at present creates innumerable wastes in terms of spaces, skills and materials. As the built environment has a great impact on the physical and mental well being of humankind, it becomes very essential to learn and understand the sensible design solutions practiced in the past, which were highly contextual and region specific. It may be quite unfashionable to look back in time and place, and devote ourselves to the cause of vernacular building practices. Yet, vernacular architecture represents more than a nostalgic longing for things and ways that have not only become obsolete, but rather a learning method by which new global challenges such as global warming, housing crises, and economic equality can be addressed (Kazimée 2009). Numerous studies and researches have been conducted so far in the domain of vernacular architecture, mainly focusing on the thermal performance assessment of the
structures. This doctoral work looks at understanding the generic sustainable design principles of the vernacular architecture of Thanjavur in Tamil Nadu, India and assessing its appropriateness in the present context, with specific reference to the housing sector.

1.2 NECESSITY FOR THE PRESENT STUDY

The changing needs and requirements, the new materials and the process of construction have shaped today’s built environment, which is mostly irrelevant to our context and climate. In the global scenario, rapid urbanization results in the merging of rural areas into the nearby towns and urban centres. The major impact of this process on the rural areas is the migration of men, their change of occupation, life style, and the introduction of new materials and techniques in construction. But, the architectural character of these rural areas is always highly sustainable in nature, due to its strong and deep rooted vernacular tradition. Vernacular structures are the true expressions of their occupants and possess high longevity and durability (Vyas, D 2005). The highly significant features of these vernacular structures are their flexibility in spatial design, thermal comfort and longevity (Singh et al 2010). Vernacular architecture is the source of essential knowledge for sustainable, energy efficient, and climate responsive architectural design principles. They express a higher degree of design sensitivity through their modest architecture. This has been more powerfully explored in domestic architecture. It is a direct response to the context, and resources such as materials and techniques, using the available indigenous skills of the area passed on from generation to generation (Christien Klaufus 2000). From the very beginning, shelters have been guided by the climate of the region. Vernacular solutions show a variety of designs related to the conditions that surround it, responding to the nature, culture, symbolic interpretations, and definition of comfort in that area (Rapoport 1969). So it becomes essential for
the present designers and architects, to understand the generic sustainable principles of the vernacular architecture which is highly specific to the context. Various studies have been done on the vernacular architecture of different regions of the sub-continent, India. The studies have mostly focused on the climate responsiveness and the thermal comfort that exists in the vernacular structures. But the unexplored areas are, the design principles adopted in these structures, the flexibility of the spaces and the materials used. These are the major contributing factors for the sustainability of the built environment in the vernacular context. Hence, this study attempts a documentation and analysis of these structures, with a specific focus on the performance evaluation in terms of the architectural design principles and indoor thermal environment.

According to the recent code of the Bureau of Indian Standards, India is divided into five major climatic zones, based on the prevailing climatic conditions. Tamil Nadu falls in the Hot Humid zone, and has different vernacular traditions in different parts of the state. Though the courtyard type houses form the major typology of vernacular housing throughout the state, variations in the characteristics of these houses are evident due to the influence of various factors such as the origin, culture, lifestyle, occupation, resources and other environmental conditions.

For the purpose of conducting the research, Thanjavur region in Tamil Nadu has been identified as the study area. The study is relevant and significant, in relation to safeguarding the architectural heritage through documentation and analysis of the vernacular dwellings of Thanjavur region, their performance in terms of spatial flexibility and thermal comfort, which also contribute to the sustainability of the structures. Furthermore, the study may contribute to the design solutions for affordable and sustainable rural housing, by adopting the explored vernacular design principles in the present
context. Thus, this thesis will be significant as a source of knowledge needed for the development of sustainable housing in Tamil Nadu.

1.3 AREA OF THE STUDY

Thanjavur offers an excellent case for the study and analysis of the sustainable features of vernacular architecture, as it is a region of historic and cultural significance located in Central Tamil Nadu, with a number of traditional settlements including different types of dwellings. The typology often changes within a short distance, in relation to the immediate environment, depending on the availability of materials and skills. Due to its geographical location, the vernacular architecture of this region could be considered as a representative style, whose influence is seen in all the vernacular traditions prevailing in other parts of Tamil Nadu.

![Location of Tamil Nadu, India](image1)

![Location of Thanjavur district in Tamil Nadu, India](image2)

(Source: Google Map2013, Maps India)

**Figure 1.1 Location of the study area**
1.3.1 Description of Study Area

The study was conducted in eight selected samples (identified as random samples based on the typology) in three settlements, namely, Vallam, Melattur and Someshwarapuram, to understand the appropriateness of the generic sustainable principles in the vernacular architecture of this region.

![Figure 1.2 Location of the identified settlements in Thanjavur region](Source: Google Map2013, Maps India)

Based on the following criteria, these typical settlements are identified for conducting the study:

- Vallam, an occupation (Agriculture) based, consciously created settlement located within the fortified town of Thanjavur. It has traditional houses which are mostly in the primitive stage in terms of spatial planning. The basic requirements are fulfilled without much elaboration and detailing.
- Someshwarapuram, an occupation (Agriculture) based, organically grown settlement. In this settlement, the dwellings show some variety in terms of spaces and their organization. The elaboration is mostly based on the economic status of the family.

- Melattur, a community (Brahmin) based, consciously created Brahmin settlement. In this settlement, the dwellings show refined spatial planning and extensive detailing, even for small dwellings with a simple spatial organization.

- Age of the structures - The typical vernacular residences are more than 250 years old.

- Flexible and strong - in terms of accommodating modern spatial changes and interventions (equipments) without losing the identity.

- Located in close proximity to Thanjavur town, but could still maintain the traditional vernacular character.

1.3.1.1 Vallam

It is a village Panchayat located 7 km south west of Thanjavur. It is one of the traditional settlements in Thanjavur region, which dates back to the 12th century AD and is located at 10.72 N and 79.08E. The main occupation is agriculture and the settlement is surrounded by paddy fields on all the sides. Originally this settlement was located within the fortified town of Vallam during the Sangam Age (2000 years ago) and the agricultural community who were to feed the inhabitants of the fortified town was the original settlers of this settlement.
As it was a consciously created settlement, and an ancient part of the present day Vallam, it shows a moderately dense, low rise development, having a regular grid iron pattern with the residential streets in east west orientation. In the lay out plan, the residences are set within a narrow plot abutting the street edge, in its front forming a strict row housing pattern. Each house has a small lane on its side, which provides access to the backyard without entering the house, making the rigid street slightly porous.

![Figure 1.3 Settlement plan of Vallam](Source: Map drawn by the researcher)

The tremendous growth along the NH67 especially in this region, due to a number of educational institutions and industries, has had considerable impact on this settlement which is located very close to the highway. It is reflected in terms of change in the occupational pattern, introduction of commercial activities into the settlement, etc.

### 1.3.1.2 Melattur

It is a small Agraharam (Brahmin settlement), situated 18 kms North East of Thanjavur at 10.86°N 79.25°E. It is one of the earliest
vernacular settlements, which dates back to the Chola period in the 12th century AD. According to history, the Chola kings have donated nearly 9000 acres of paddy lands as a gift to 500 brahmin families, including the people of both Tamil and Telugu origin (kuchipudi dancers). The dance called Bhagavetha Mela, a fusion of both Baratham and Kutchipudi, was developed here and lent an identity to this village. The settlement has three temples in the core area and two on its periphery, surrounded on all sides by paddy fields and narrowly spaced coconut groves.

The settlement follows a strict grid iron pattern, with the main access roads running East – West and North – South, thus dividing the entire settlement into four unequal quarters, and all the residential streets run East – West. Originally the settlement had three main streets (Agraharam streets) which form the core, and five streets (one on the southern side and four on the northern side), where the other community people (the supporting group) lived. The entire settlement has mostly single storey tiled structures or G+1 structures with Madras Terrace roofing.

Figure 1.4 Settlement plan of Melattur

(Source: Map drawn by the researcher)
The main occupation of the settlers is agriculture. The inhabitants of the settlement are landlords engaged in agricultural activities, not directly but by appointing labourers residing in the peripheral streets of this settlement. The Cultural festival Bhagavatha Mela, which is being conducted for 10 days is the binding factor for the entire settlement.

1.3.1.3 Someshwarapuram

It is a small village situated 25 kms North of Thanjavur town at 10°55’ 09.2’’ N and 79°09’ 12.5’’ E. The history of this settlement dates back to the Chola period and the focus of the entire settlement, is the Someshwarar temple. The main occupation of this settlement is agriculture, from its origin. The wealthy landowners occupied the central part of the settlement, and the service community including the agricultural labourers had settled along the periphery. So, this settlement consists of all typologies of houses such as the primitive kachcha construction, the tripartite house without a central open court, the house with a central open court, and the house with the double height central space with clerestory openings (Eduthukatti houses).

![Settlement plan of Someshwarapuram](source: Map drawn by the researcher)
1.4 RESEARCH HYPOTHESIS

Vernacular architecture represents inherent, unwritten information for understanding the value of experiences related to sustainability. The hypothesis of this research is that the sustainability of the vernacular dwellings in Thanjavur region is mainly due to:

- Spatial Flexibility in accommodating changing needs and
- Energy Efficiency in terms of materials and construction techniques,

irrespective of the typology of dwellings. The spatial organization as a result of their culture, tradition and belief has given form over time which has ultimately led to efficient utilization and flexibility of spaces and energy efficient architectural solutions.

1.5 OBJECTIVES OF THE STUDY:

The major objective of this study is to identify, document and describe the three different typologies of houses in Thanjavur region, and analyze them in terms of spatial qualities and thermal performance. The major objective will be achieved only when the following tasks are carried out and completed successfully. They are:

1. Studying and analyzing the characteristics of vernacular structures in Thanjavur region, in terms of settlement planning and individual structures.

2. Studying the impact of urbanization on the vernacular settlements and the vernacular dwellings.
3. Evaluating the performance of the vernacular structures in terms of spatial design, climate responsiveness, thermal performance and structural stability, etc.

4. Studying and understanding the energy efficiency concepts adopted in these structures, and their relevance in the modern context.

5. Assessing the ability of these structures to accommodate changes with respect to social conditions and life styles.

1.6 RESEARCH QUESTIONS

Since the major objective of this study is to identify, document and describe the three different typologies of houses in Thanjavur region, and analyze them in terms of spatial qualities and thermal performance, the research questions are as follows:

1. What is the current status of the vernacular settlements and individual structures in Thanjavur region?

2. How are the structures performing in terms of their spatial design, climate response, structural stability, etc, in the changing global scenario?

3. What are the generic sustainable principles which are responsible for the performance of these structures?

4. What are the suitable design principles and the elements in the built environment of the present condition?

5. How far are the vernacular dwellings suitable in accommodating the changing activities and life styles of today?
1.7 SCOPE AND LIMITATIONS OF THE STUDY:

1. The geographic study area is confined to three traditional settlements in Thanjavur region, identified based on certain criteria such as
   - Historical background
   - Cultural aspects
   - Distance from Thanjavur town.
   - Connectivity and accessibility to the town.
   - Age of the structures
   - Physical condition of the structures.

2. Though vernacular housing consists of varied dwelling types, ranging from a rudimentary rural hut to palatial structures, the study is focused only on the three typologies of the courtyard houses of Thanjavur region.

3. Vallam is considered for the study though it does not have typology 3 dwellings, because it is the only traditional settlement in this region, which is located within the fortified town.

4. Eight sample dwellings belonging to three typologies are chosen from three identified settlements for the performance evaluation, study and analysis.

5. The analysis is limited to spatial qualities and flexibility, climate responsiveness of the structures and thermal performance, to identify the generic sustainable principles.

6. The thermal performance analysis of the dwellings was carried out, using ECOTECT 2011 software for the hottest (May 2013) and the coldest months (January 2013) of the year.
1.7  STRUCTURE OF THE THESIS

This thesis comprises of nine chapters which are grouped in three major parts. The first Part includes three chapters;

Chapter 1 gives a brief introduction to the research topic, the necessity for the study, the aim and objectives of the study, and the scope and limitations of the study. It also describes the contextual relevance of the identified area chosen for conducting the study.

Chapter 2 attempts to understand certain important aspects relevant to the research undertaken through the literature review. The concept of sustainable housing and the contributing factors to the same, vernacular architecture in general and with specific reference to India, climate responsive architecture in different bioclimatic regions, and the thermal performance evaluation of vernacular structures conducted using different tools and techniques, are the important topics reviewed in this chapter.

Chapter 3 deals with the methodology adopted to collect data from various sources and the tools and techniques adopted for the same in the field and analysis framework.

The second part includes chapters 4 to 7 mainly discussing on the general characteristic features of vernacular settlements in Thanjavur region, and the performance evaluation of the selected sample dwellings in the identified study area.

Chapter 4 explains the evolution of vernacular dwellings and their different typologies. It also describes in detail, the selected sample dwellings in the identified study area.

Chapter 5 includes the complete architectural assessment of the samples, in terms of spatial analysis, qualities of spaces, and their impact on quality of life of the occupants.
Chapter 6 explores the energy efficient concepts and climate responsive features of the different typologies of selected samples, and the role of indigenous materials and techniques of the region in the same.

Chapter 7 highlights the thermal performance analysis of the sample dwellings and presents the results of the comparative analysis of each typology.

The third and final part comprises of the following:

Chapter 8 presents the findings of the study and a discussion on the results.

Chapter 9 provides the recommendations and conclusion, and also discusses the possibilities of further research on the same topic, for which this research would act as a primary data source.